

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims:

1-42. (cancelled)

43. (currently amended) A recombinant hemin protein having the capacity to reversibly bind oxygen, comprising at least one iron-containing porphyrin nucleus, of plant origin, and a protein component comprising at least one polypeptide chain selected from the group consisting of hemoglobin, myoglobin, cytochromes, peroxidases, and catalases; of animal origin.

44. (currently amended) The recombinant protein according to claim 43, wherein the at least one iron-containing porphyrin nucleus is iron-containing protoporphyrin IX, or a protoporphyrin differing from protoporphyrin IX in the nature of the side chains, carried by the β atoms of pyrrole pyrrole rings.

45. (currently amended) The recombinant protein according to claim 43, wherein the protein component comprises at least one α and/or β -globin polypeptide chain, or variants of the said polypeptide chain, comprising one or more amino acid substitution(s), deletion(s) or insertion(s), wherein the variant of the α chain has at least 90% homology with an α chain having an amino acid sequence of SEQ ID NO:31 and the variant of the β chain has at least 90% homology with a β chain having an amino acid sequence of SEQ ID NO:33, and the hemin protein being is capable of binding oxygen reversibly.

46. (currently amended) The recombinant protein according to claim 45, wherein the α or β -globin chain, or variants of the said polypeptide chain, further comprises in addition a chloroplast targeting signal, a mitochondrial targeting signal, or a N-terminal signal peptide in combination with a signal responsible for retaining a protein in the endoplasmic reticulum or a N-terminal signal peptide in combination with a vacuolar targeting signal.

47. (previously amended) The recombinant protein according to claim 45, wherein each α and/or β -globin polypeptide chain lacks an NH₂ terminal methionine.

48. (currently amended) The recombinant hemin protein according to claim 43, wherein the protein component comprises at least four polypeptide chains of α and/or β -globin or variants of the said polypeptide chain, each said polypeptide chain being bound to an iron-containing protoporphyrin nucleus, wherein the variant of the α chain has at least 90% homology with an α chain having an amino acid sequence of SEQ ID NO:31 and the variant of the β chain has at least 90% homology with a β chain having an amino acid sequence of SEQ ID NO:33, and the hemin protein is capable of binding oxygen reversibly.

49. (previously amended) The recombinant protein according to claim 48, wherein the protein component comprises 2 α -globin chains and 2 β globin chains, or variants of the said polypeptide chain.

50. (previously amended) The recombinant protein according to Claim 43, wherein said protein binds oxygen with an affinity of between 7 and 40 mm Hg.

51. (previously amended) A pharmaceutical product comprising one or more recombinant hemin protein(s) according to Claim 43 in association with a physiologically acceptable excipient.

52. canceled

53. (new) A recombinant hemin protein having the capacity to reversibly bind oxygen, comprising at least one iron-containing porphyrin nucleus of plant origin, and a protein component comprising at least one polypeptide chain selected from the group consisting of hemoglobin, myoglobin, and cytochromes of animal origin.

54. (new) The recombinant protein according to claim 53, wherein the at least one iron-containing porphyrin nucleus is iron-containing protoporphyrin IX, or a protoporphyrin differing from protoporphyrin IX in the nature of the side chains, carried by the β atoms of pyrrole rings.

55. (new) The recombinant protein according to claim 53, wherein the protein component comprises at least one α and/or β -globin polypeptide chain, or variants of said polypeptide chain, wherein the variant of the α chain has at least 90% homology with an α chain having an amino acid sequence of SEQ ID NO:31 and the variant of the β chain has at least 90% homology with a β chain having an amino acid sequence of SEQ ID NO:33, and the hemin protein is capable of binding oxygen reversibly.

56. (new) The recombinant protein according to claim 55, wherein the α or β -globin chain, or variants of the said polypeptide chain, further comprises a chloroplast targeting signal, a mitochondrial targeting signal, or a N-terminal signal peptide in combination with a signal responsible for retaining a protein in the endoplasmic reticulum or a N-terminal signal peptide in combination with a vacuolar targeting signal.

57. (new) The recombinant protein according to claim 55, wherein each α and/or β -globin polypeptide chain lacks an NH₂ terminal methionine.

58. (new) The recombinant hemin protein according to claim 53, wherein the protein component comprises at least four polypeptide chains of α and/or β -globin or variants of said polypeptide chain, each said polypeptide chain being bound to an iron-containing protoporphyrin nucleus, wherein the variant of the α chain has at least 90% homology with an α chain having an amino acid sequence of SEQ ID NO:31 and the variant of the β chain has at least 90% homology with a β chain having an amino acid sequence of SEQ ID NO:33, and the hemin protein is capable of binding oxygen reversibly..

59. (new) The recombinant protein according to claim 58, wherein the protein component comprises 2 α -globin chains and 2 β globin chains, or variants of the said polypeptide chain.

60. (new) The recombinant protein according to Claim 53, wherein said protein binds oxygen with an affinity of between 7 and 40 mm Hg.

61. (new) A pharmaceutical product comprising one or more recombinant hemin protein(s) according to Claim 53 in association with a physiologically acceptable excipient.

62. (new) The recombinant protein according to claim 53, wherein the protein component comprises at least one α and/or β -globin polypeptide chain, or variants of said polypeptide chain, wherein the variant of the α chain has a heme binding domain and the variant of the β chain has a heme binding domain and the hemin protein is capable of binding oxygen reversibly.